FCC 96-207

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Advanced Television Systems	)	
and Their Impact Upon the	)	MM Docket No. 87-268
Existing Television Broadcast	)	
Service	)	

FIFTH FURTHER NOTICE OF PROPOSED RULE MAKING
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The opinions expressed in these comments are those of the authors only. None of the authors is currently involved in MIT's Advanced Television Research Program.

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EXECUTIVE SUMMARY

The Federal Communications Commission, together with the Advisory Committee on Advanced Television Services and the Grand Alliance, have been instrumental in spurring forward the development of new television systems. These contributions can benefit U.S. citizens in a variety of ways. However,

- advanced digital television is but one of a number of broadcast digital media services that will be of interest to consumers, and

- digital communication invites constant improvement and innovation and is in the midst of a period of particularly fruitful development.

In light of these conditions, the Commission needs to ensure stability for consumers and producers while simultaneously enabling innovation to continue. This apparent paradox dissolves if the Commission adopts a minimal set of advanced digital television specifications – specifically a modulation method and bit stream protocol. Such a step would enable a broad variety of digital media, including advanced television services, to be more responsive to the needs of viewers and providers than is possible with the proposed highly specified standard.

Mandating such a highly specified definition of the contents of a digital bit stream would harm a wide range of both consumer and producer interests and may in fact be actually harmful to the broadcast industry, since consumers and producers will be more tempted to shift their attention to more flexible computer networked approaches to digital communication.

Speculation on the social consequences of accelerating abandonment of broadcast television are beyond the scope of these comments, but should be weighed by the Commissioners in their deliberations on this matter.

Our comments focus on a more flexible and long-term alternative, which we commend to the Commissioners for their consideration.

Introduction: How Should the Commission Proceed?

We appreciate the valuable contribution made to the advancement of digital television and related technologies by the Federal Communications Commission, its Advisory Committee on Advanced Television Services, and the Grand Alliance. In the end, we hope this will benefit U.S. citizens in a variety of ways.

However, now it is time for the Commissioners to take a bold step which will best foster the future of digital communications, by

1) specifying a modulation standard for digital television broadcasting.

2) The modulation standard would be the central element of a mechanism for a bit stream layer transmission standard (into which, *e.g.*, MPEG-2 could fit)

3) The FCC should allocate channels; as a condition of getting spectrum, all providers should have the same regulatory requirements as determined by the FCC, whichever media or technical standards they employ.

4) The factors the FCC may wish to consider in specifying what it is that broadcasters must do might include: number of hours per day of digital television transmission, minimal Quality of Service specifications, and that a measurable audience share is attracted to the programs broadcast.

Our Reasoning in More Detail

Other experts have related (and doubtless will continue to relate) their specific objections to technical features of the Grand Alliance advanced television proposal. While we agree there are problems with certain aspects of the proposal, we concentrate our comments on the inadvisability of mandating *any* standard for digital information coding in such a specific way that the flexibility, adaptability, and evolution of digital information processing are defeated – a situation that we feel would not serve the consumer, the broadcaster, the manufacturer, or the industry organizations responsible for achieving consensus on these sorts of standards.

The nature of digital communication is one of continual improvement. Instead of a hard-wired electronic typewriter, an office is now likely to have a personal computer running word-processing software whose capabilities will likely be updated several times during the life of the machine. This situation benefits the purchaser, who can (if he or she so chooses) enhance the performance of an existing machine. It also creates opportunities for the developers of the software to improve their existing products and regularly release new products that answer the users' requests and the take advantage of the programmers' growing knowledge and expertise.

In the world of digital signal processing, it is quite common for devices that are not general purpose computers to be designed in such a way that they can be reconfigured to give them new functions or to enhance current ones based on experience gained after the devices were manufactured. This is not a laboratory curiosity or an expensive, esoteric technology, but rather a design principle that has quietly been deployed in consumer products for several years. Many computer printers can be upgraded by downloading new "firmware" from the computer to which they are connected, and at least one make of automobile (Saturn)

regularly has improved versions of its engine and transmission controllers' operating configurations downloaded when brought in for routine maintenance. This is a technology applicable to consumer television receivers, as is demonstrated by the fact that many digital satellite and cable video decoders have the ability to reconfigure themselves, through information transmitted along with the video signal.

Despite our belief in keeping things as open and flexible as possible, we still feel the FCC has a regulatory role to play in enabling the rapid development of advanced television services in a way that best serves the public interest. The modulation method – that is, the technique by which a stream of digital bits is turned into a radio-frequency signal for transmission through a 6 megahertz channel – is critically related to interference with other channels and services, broadcast coverage area, and efficient use of spectrum. The broadcaster's modulation circuitry and the receiver's demodulator are also the portions of circuitry that are least amenable to modification once installed. For these reasons, we feel that it is essential for the FCC to specify an efficient modulation method.

To be explicit, we feel a standard endorsed by the FCC for advanced television is required to serve the public interest. That standard, however, should only specify the modulation method and bit stream protocol, and not constrain manufacturers and viewers by limiting advanced television only to what is feasible today – when we can safely assume better technologies will be available tomorrow.

If a standard as detailed as the Grand Alliance system specifications is adopted by FCC action, evolution of the standard to accommodate advances in picture and sound quality, to add features desired by consumers or program providers, or to allow applications not anticipated by the system design would require an FCC rulemaking rather than merely agreement among industry groups. The likely result will be stagnation, not the rapid innovation and improvement that has characterized other digital media such as the Internet.

The United States is an early adopter of advanced television technologies, an enviable situation on the global scene, but also one that in the absence of the ability to upgrade can eventually leave us wedded to a less-advanced technology than parts of the world that have benefited from our experience. Europeans to this day denigrate our analog NTSC color television system as "Never Twice the Same Color" and note that by waiting another decade to adopt color TV they were able to design their PAL system to address what they felt were some of the worst shortcomings of NTSC. Although one might consider the European television standards PAL and SECAM flawed because they are slightly less spectrum efficient than NTSC or have a lower display frame rate, nonetheless NTSC's European critics have a point. We'd like to avoid repeating that scenario in the digital age, especially since digital technology inherently invites constant improvement.

Digital video coding is as yet a young technology, and we expect that when it is applied on as large a scale as would be involved in terrestrial broadcasting, discoveries will be made that will suggest modifications and extensions that will improve the standard. We anticipate that if the regulatory course we advocate is taken, broadcasters and manufacturers will still initially adopt elements of the Grand Alliance standard. The difference will be that ten years later, the broadcast television bit stream will have undergone a rapid evolution, resulting in improved viewing for the consumer; more service opportunities for the broadcaster; continued research, development, and new market opportunities for the manufacturer; and interoperability with other devices such as personal computers and other media such as the Internet – which we expect to have changed into something very different from what they are today.

The Grand Alliance advanced television standard represents the best efforts to date of many individuals and firms to bring broadcasting into the digital age. Its fatal flaw however is that it overly constrains future technical advances which could improve the quality and features of television. We are confident that the same individuals and firms, as well as new entrants, will do much better in the future with ever-more-powerful digital technologies at their disposal. A streamlined FCC advanced television modulation standard, coupled with evolving industry standards for picture, sound, and ancillary data formats will enable broadcasters and others to reach the widest possible audience with programming incorporating the most desired features. We encourage the FCC to help them do so.

To summarize our observations,

1) the proposed Grand Alliance standard is fatally flawed in its over-specificity and lack of extensibility,

2) a more flexible and evolutionary digital television system can be implemented, but

3) definition of a modulation standard and bit stream protocol by the FCC is still required for this to happen.

Attachment A

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1 Diskette